Mechanical Engineering
DESIGN EXPO

Musco Sports Lighting Capstone Project

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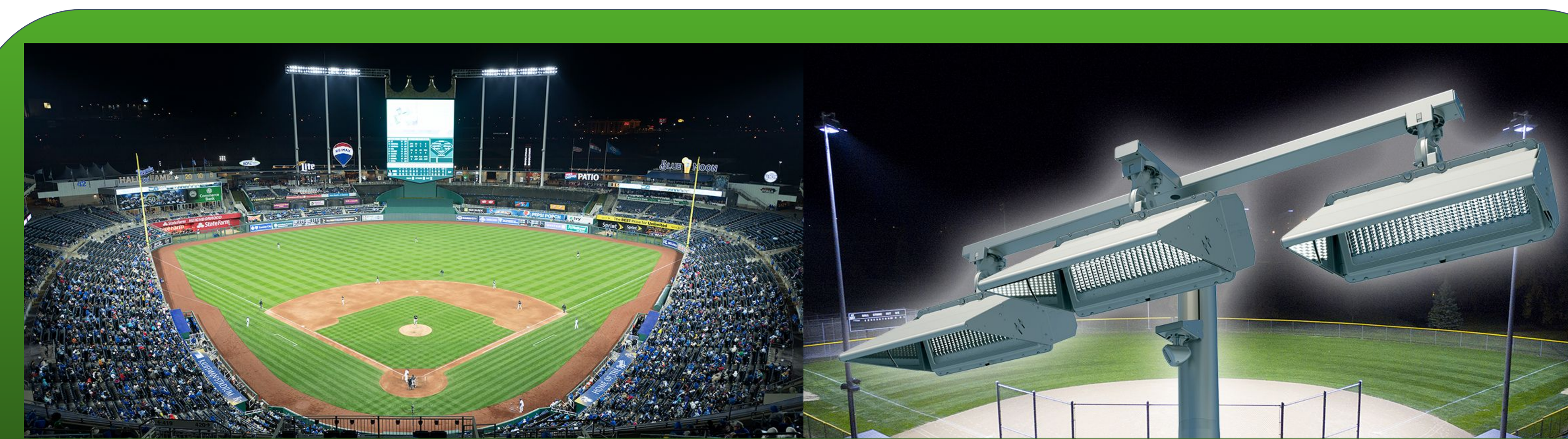
Mechanical Engineering, ME 466-A, Team LM4

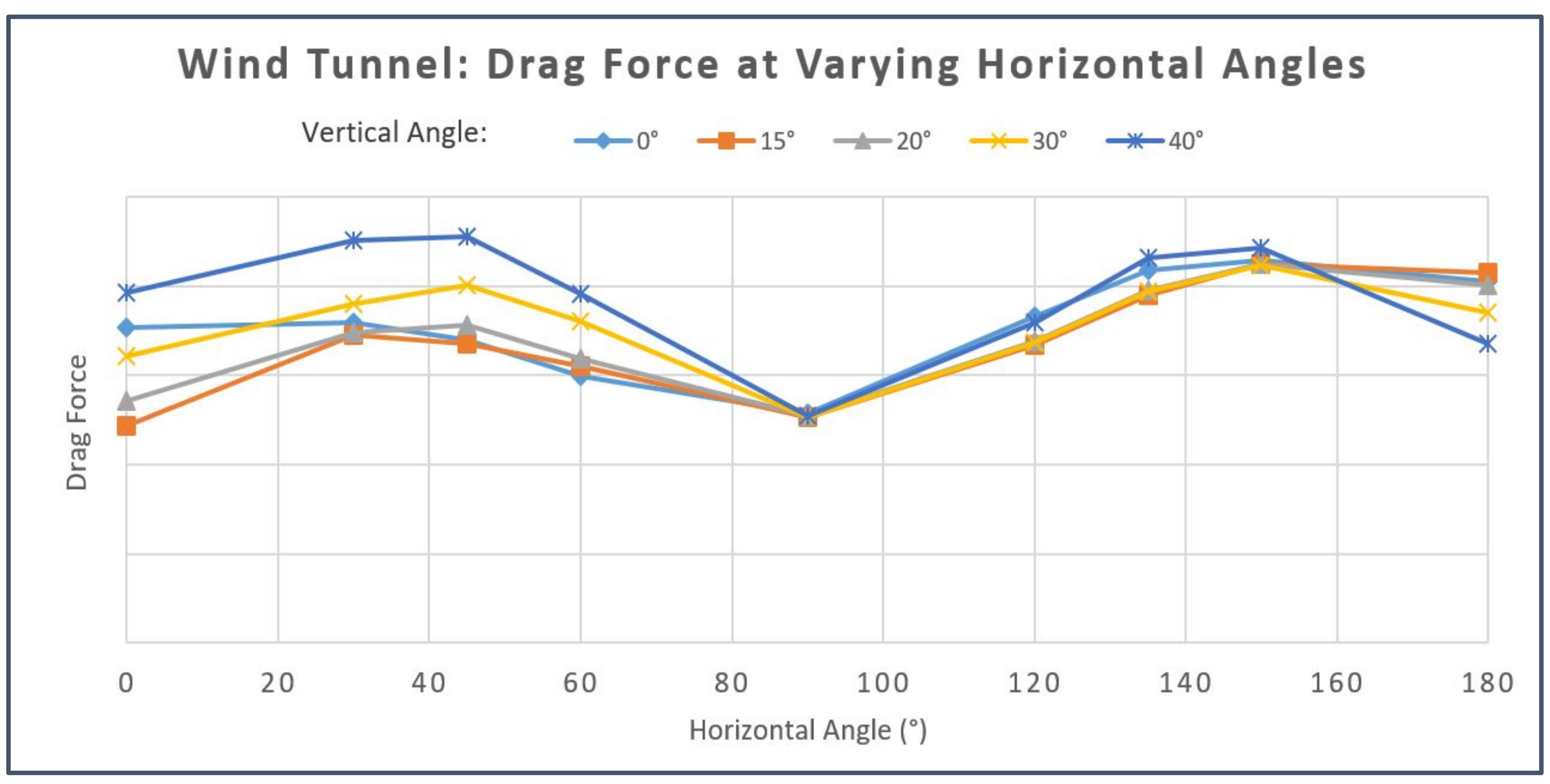
Objectives

- Calculate the drag force of a 1500 Watt Musco Sports Light at 54 angle combinations.
- Determine the effective projected area.
- Draft redesign options to reduce the drag force.
- Compare the computer simulated drag force to the drag force measured in a wind tunnel.



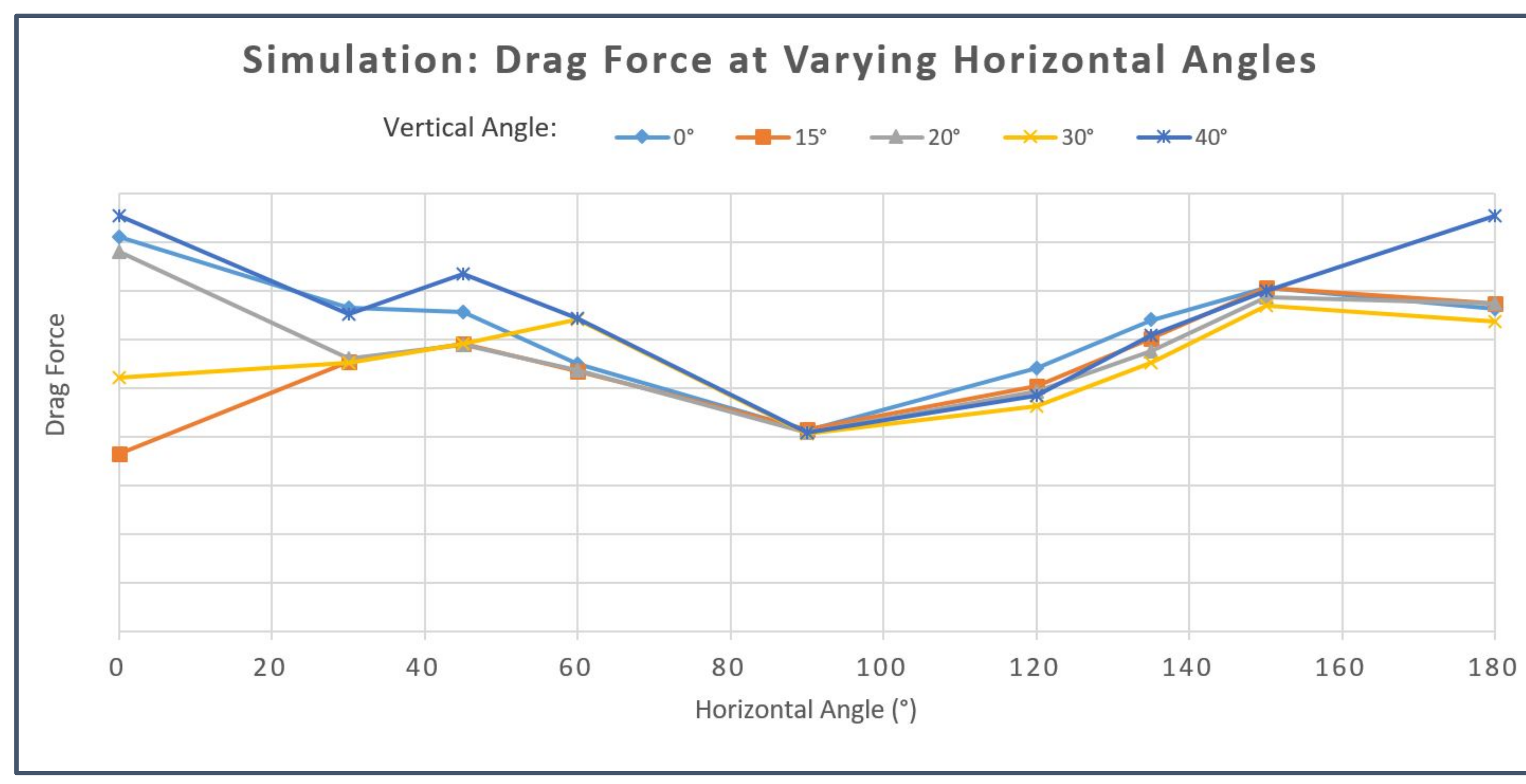
Musco Sports Lights are used in stadiums all over the world, including Kauffman Stadium (pictured left), home of the Kansas City Royals.

Wind Tunnel Data



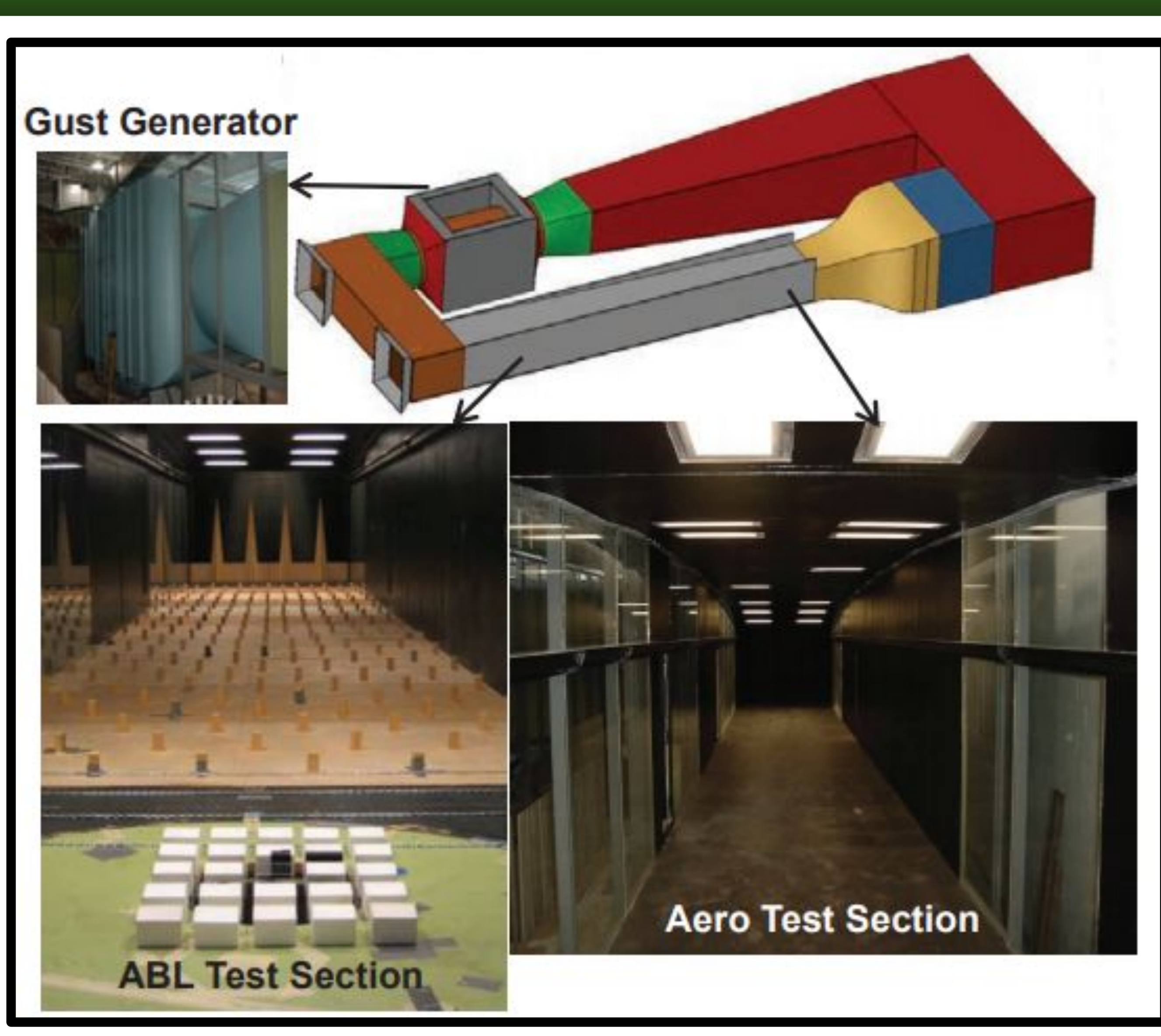
The drag force values are highest for a vertical angle of 40 degrees. The drag force values converge at a horizontal angle of 90 degrees.

Simulation Data

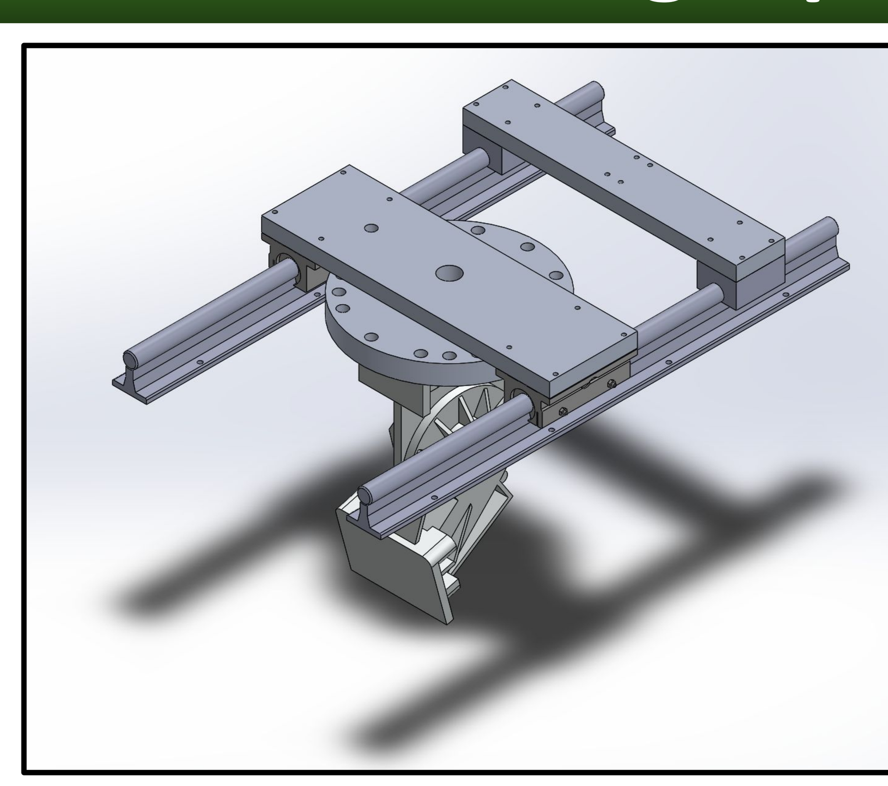


Similar to the wind tunnel data, the drag force values converge at a horizontal angle of 90 degrees. Horizontal angles of 0 and 180 degrees deviate signficantly from wind tunnel data.

Methods and Testing Equipment



This is the Iowa State University Aerodynamic / Atmospheric Boundary Layer Wind and Gust Tunnel located in Howe Hall.

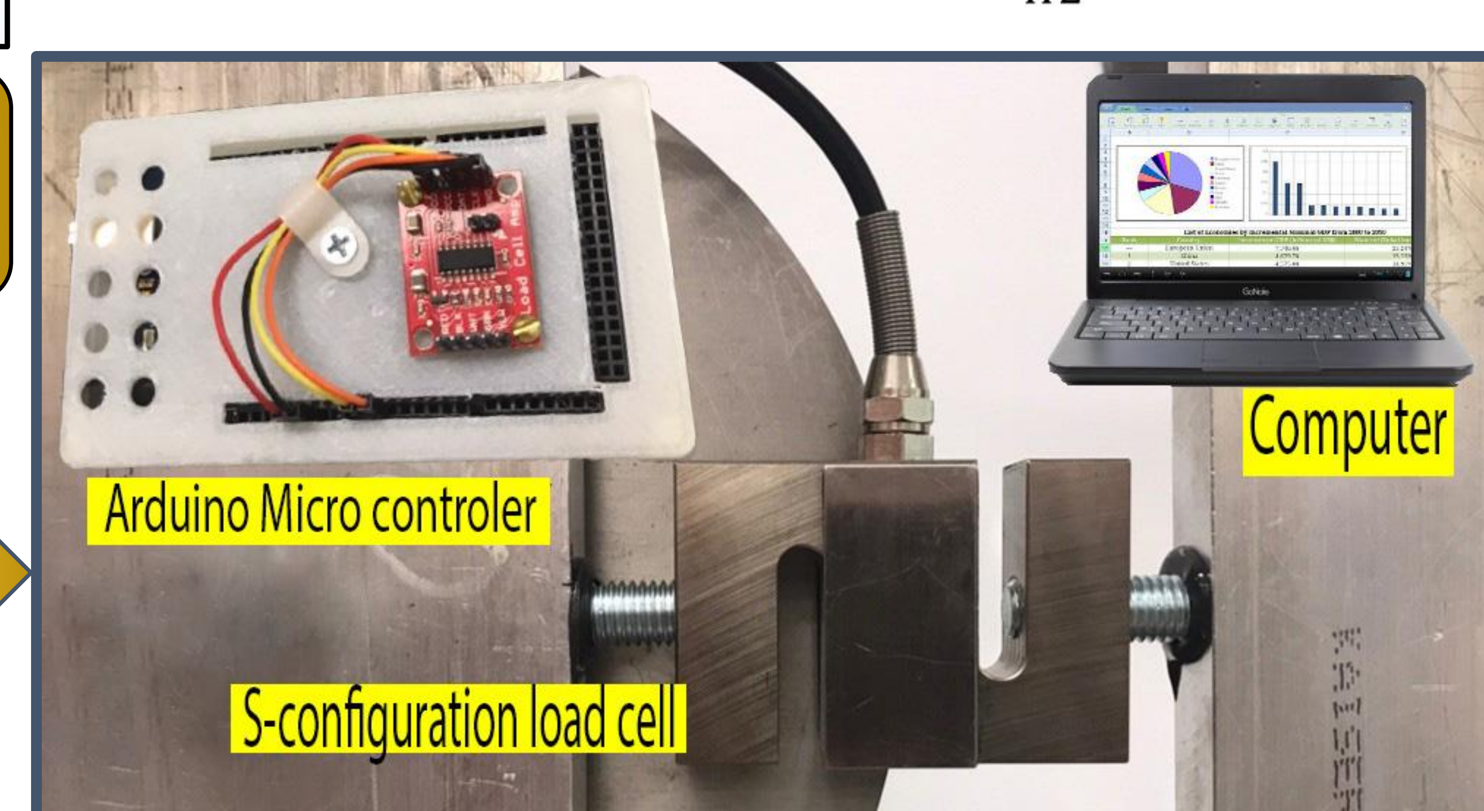


The light fixture was secured in the wind tunnel using the bracket pictured above.

Below are the equations used to determine the velocity of the wind tunnel.

- Dynamic pressure: $\Delta P = P_{wind,on} - P_{wind,off}$
- Ideal gas equation: $\rho = \frac{P_{atm}}{RT}$
- Bernoulli's Equation: $v_1 = \sqrt{\frac{2\,\Delta P}{\rho}}$
- Continuity Equation: $v_2 = v_1 \cdot \frac{H1}{H2}$

The drag force was measured using an s-type load cell connected to an Arduino microcontroller.



Iowa State University
Department of Mechanical Engineering

This poster was approved for public display by Phil Hol, Senior CFD Research Engineer, Musco Sports Lighting, LLC